Software Reuse for Environmental Decision-Making
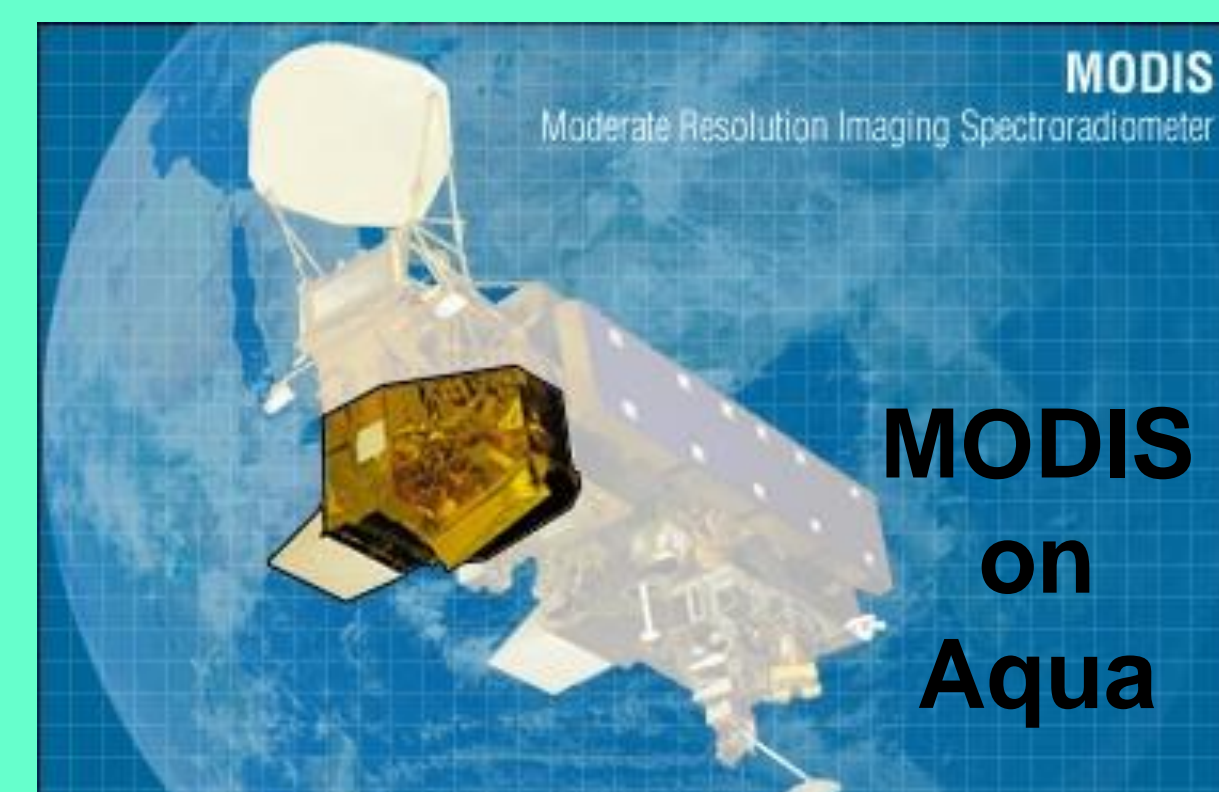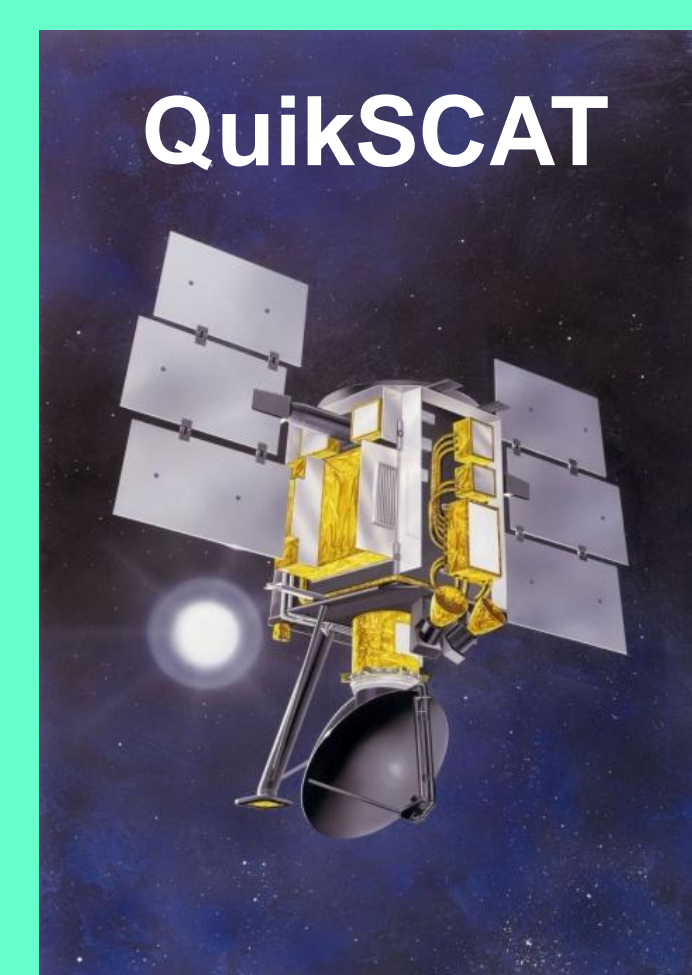
Abstract

NASA remote sensing data contributes to the environmental decision-making capabilities of policy makers and government agencies. Data products, including Level 2 data from missions such as QuikSCAT, MODIS, and the like, are leveraged to create many derived decision-making products, such as snow-water measurements useful for water and resource management at the local, municipal, county, state, and national levels.

Decision-making software includes several distributed components, including Web Mapping Servers (WMS), Web Feature Servers (WFS), and data management services. One of the major assumptions made by decision-making software systems is that the data it visualizes and operates on are cached internally, or locally to the system, and that the data are provided in a standard format, e.g., Base Maps, Elevation, or GeoTIFF files. However, with NASA observational data, the sheer volume of information to cache (and replicate), and the distributed nature of the data, precludes this type of approach outright.
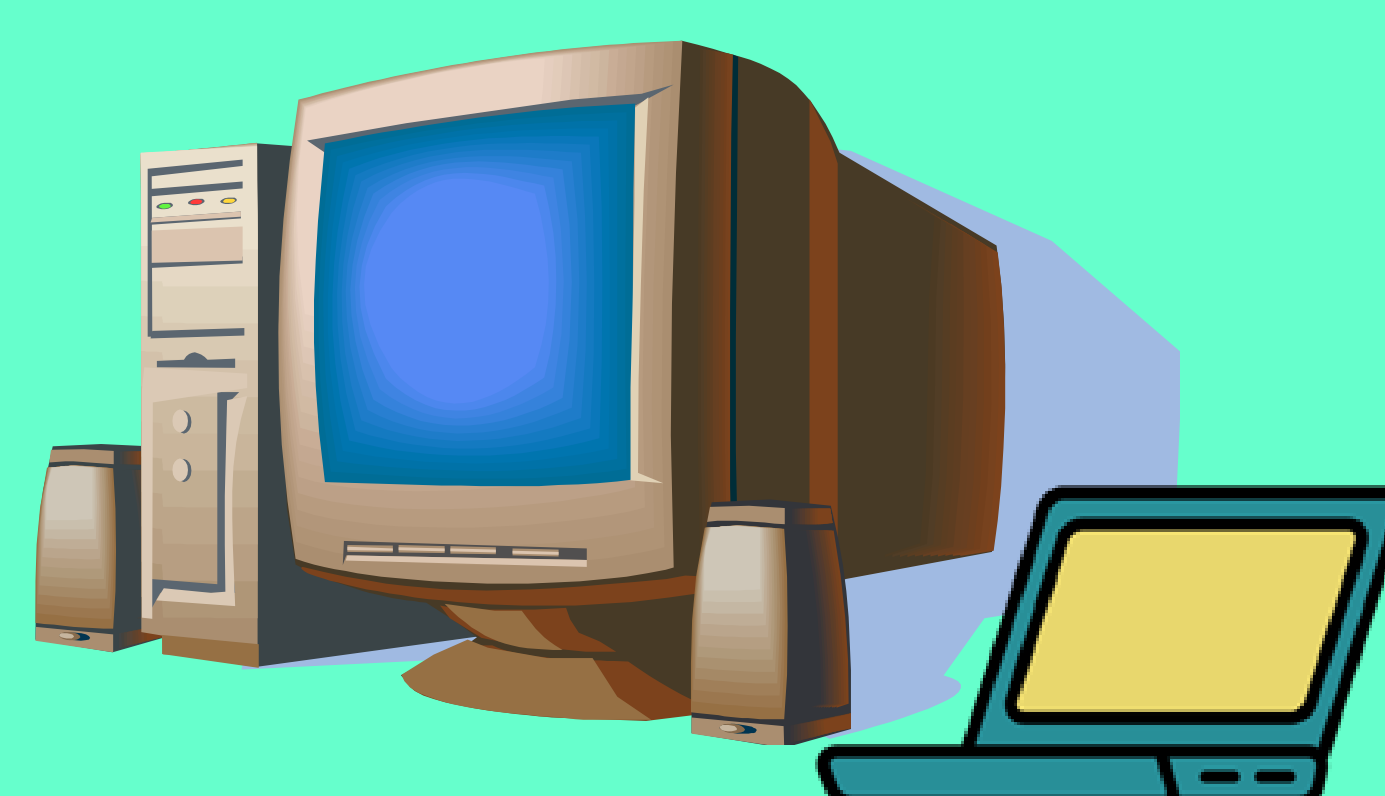
The NASA Earth Science Data Systems (ESDS) Software Reuse Working Group has been actively investigating approaches to leverage existing software components developed for scientific research that could contribute to the development of applications to support environmental decision-making, and to address the issues stated above. We posit that using existing software components from scientific applications when developing decision-making software (such as components for data retrieval, metadata extraction, and data transformation, e.g., from NASA HDF/HDF-EOS to GeoTIFF) will provide significant reduction in costs and schedule, allowing software developers to "bridge the gap" in leveraging NASA observational data to assist environmental decision-making.

Opportunities for Software Reuse

QuikSCAT

MODIS
Moderate Resolution Imaging Spectroradiometer

MODIS on Aqua

1001001010010101000110101010111...

Data from **current …**

and **future missions ...**

are **processed ...**

and **stored ...**

WMS

Data Management

WFS

before being **disseminated …**

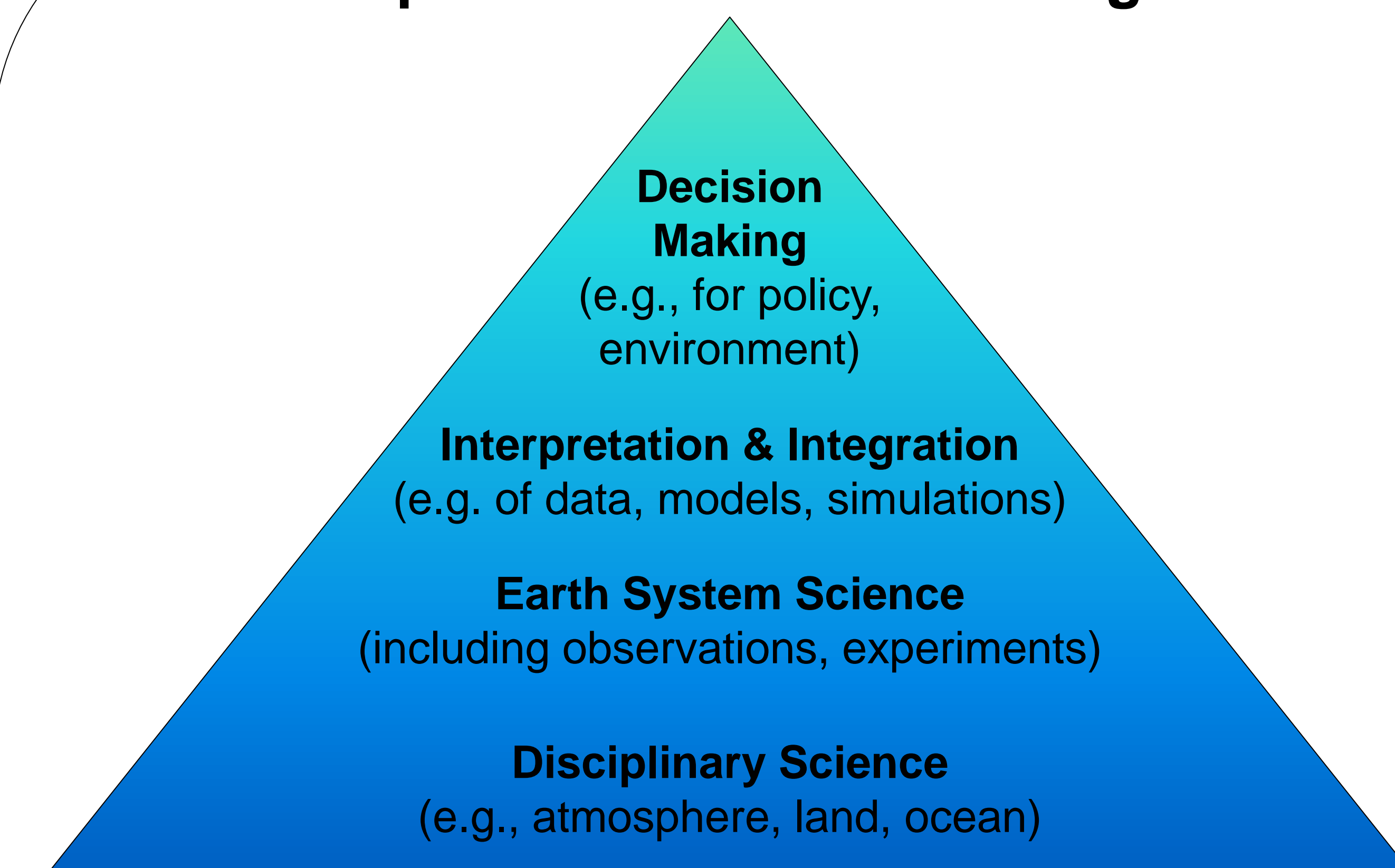Retrieve Data

Extract Metadata

Transform Data
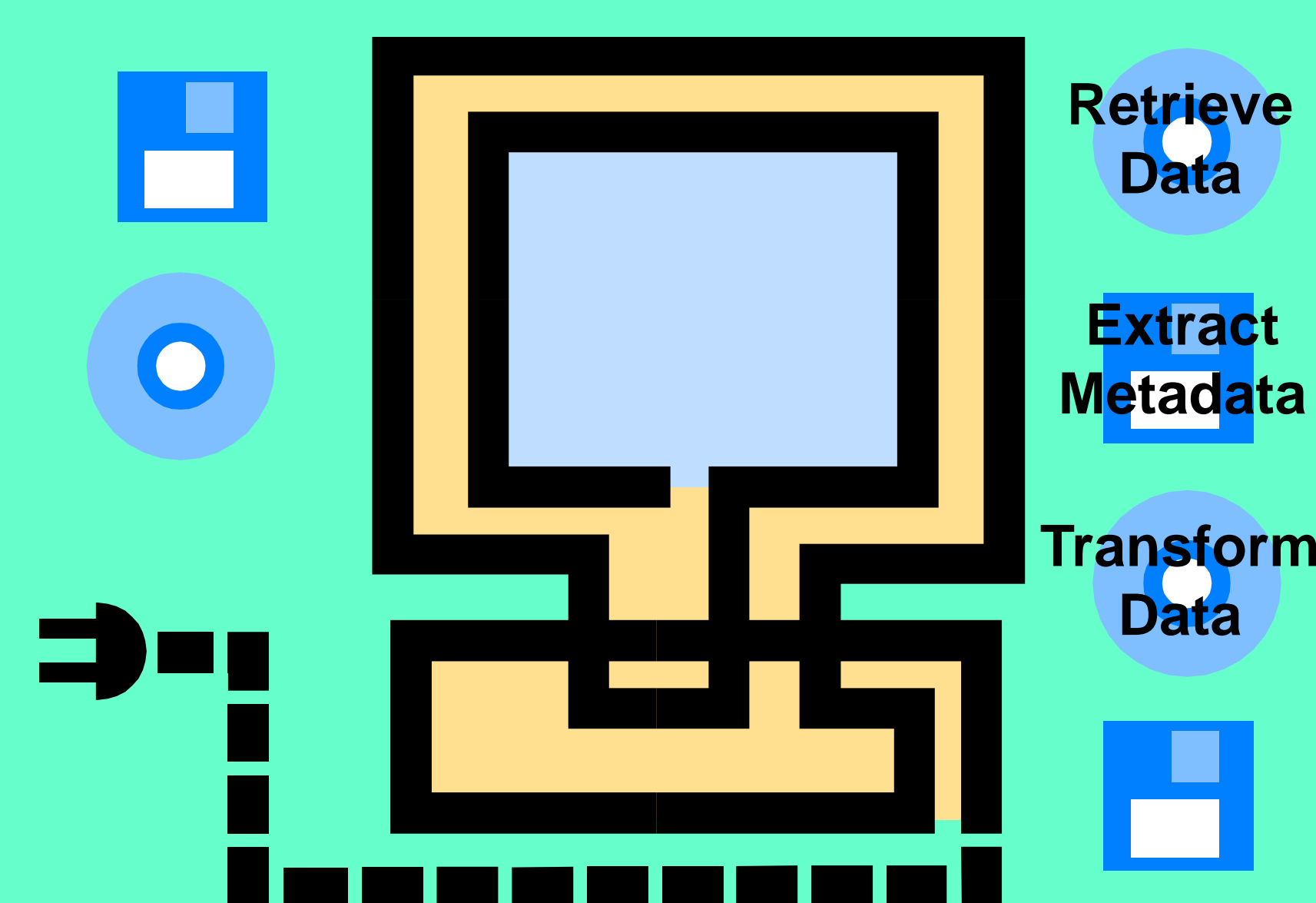
for use in various **applications ...**
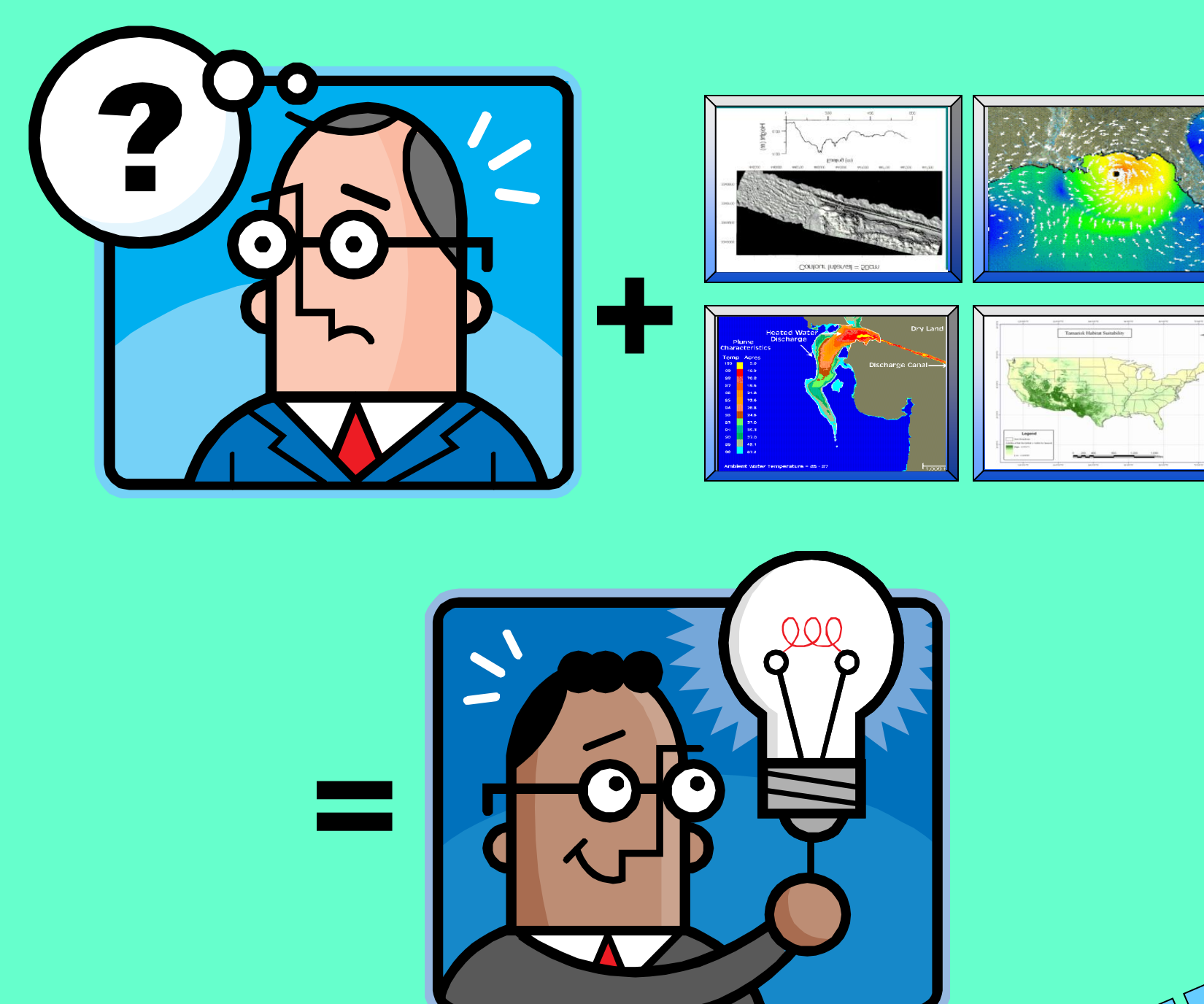
whose **results** are used to aid **decision-making ...**

… at different **levels**.

Aspects of Decision-Making

Decision Making
(e.g., for policy, environment)

Interpretation & Integration
(e.g. of data, models, simulations)

Earth System Science
(including observations, experiments)

Disciplinary Science
(e.g., atmosphere, land, ocean)

A Basic NASA Decision-Making Process

INPUTS	Data from Earth observations and measurements (ground and satellite) feed into Earth system models (e.g., of land, atmosphere, ocean)
OUTPUTS	Predictions and forecasts are made based on the models and observations.
OUTCOMES	The outputs above feed into decision support systems and assessments.
IMPACTS	Decisions (e.g., policy and management) are made to provide value and benefit to citizens and society.

Levels of Decision-Making

International

National

Regional

Local

For more information about the NASA ESDS Software Reuse Working Group, please visit
http://www.esdswg.com/softwarereuse

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